

## REMARKS

Applicant appreciates the consideration shown by the U.S. Patent Office, as evidenced by the April 10th, 2007 Office Action. Claims 1-136 are pending in the application and Claims 93-99, 121-136 have been withdrawn, with claims 1-92 and 100-120 rejected. Claims 1-56, and 67-76 have been cancelled. As such, claims 57-66, 77-92, and 100-120 remain in the case with none of the claims being allowed.

The April 10th, 2007 Office Action has been carefully considered. Applicant respectfully requests reconsideration of the application by the Examiner in light of the above amendments and the following remarks.

Applicants thank Examiner Singh for indicating that the information disclosure statement (IDS) filed on January 17, 2007 were received and considered.

Applicants have further submitted an IDS on March 19, 2007, which was not indicated to have been considered by the Examiner. Applicants request that in the next Office Action, the Examiner acknowledge receipt and consideration of the references cited therein.

The Office Action rejected Claims 1-92 and 100-120 under 35 U.S.C. 103(b) as allegedly anticipated by Vierheilig U.S. Patent 6,028,023) ('023) alone or as further evidenced by Stamires et al 20020110520 A1) and in the alternative as obvious over Vierheilig (U.S. Patent 6,028,023) alone in view Stamires.

Although the Office Action even admits that '023 is silent as to the reduction of sulfur in gasoline produced in an FCC unit, nonetheless, the Office Action erroneously alleges that reference(s) discloses:

“use of HTL compound in an FCC unit as a catalyst per se (e.g., as hydrocarbon cracking catalyst for fluid bed systems), as SOx binding agents, or as catalyst binder materials for other catalyst materials (See column 7, lines 39-42; column 16, lines 13-16). Thus, under 35 U.S.C. 102 (b), the presence of HTL compound in the FCC unit would appear to inherently produce gasoline with reduced sulfur.” (Office Action page 5 last paragraph).

“Stamires discloses a similar shaped HTL composition (See page 2, paragraph 0041) produced by similar steps (See page 2, paragraphs 0034-0042; page 3, paragraphs 0042-0057; page 4, paragraphs 0059-0067) as Vierheilig and further discloses, “These compositions appear to be highly suitable for use as an

additive or as a matrix for catalysts for hydrocarbon conversion, e.g., FCC and HPC.” (Office Action page 5 last paragraph).

“The Applicant’s argument is not persuasive because Vierheilig discloses, “The HTL (hydrotalcite like) compounds of this patent disclosure may be used as catalyst binder materials for other catalyst materials.” (Column 7, lines 39-42). Thus, gasoline produced in Vierheilig invention will inherently have reduced sulfur. Also, the new rejection uses Stamires reference which explicitly discloses, “These compositions appear to be highly suitable for use as an additive or as a matrix for catalysts for hydrocarbon conversion, e.g. FCC and HPC. They are especially suitable for sulfur removal from the gasoline and diesel fraction “in FCC, SOx, and NOx removal in FCC, and as a metal trap. (Page 4, paragraph 0068). (Office Action page 12).

Each assertion is addressed below.

#### Novelty and Non-obviousness regarding Independent Claims 57, 77, 100, and 104

Independent claims 57, 77, 100, and 104 are novel and non-obviousness because the reference, individually or combined, do not disclose methods of using a precursor (also referred as mixed metal oxide in the claims) in general and not in an FCC unit.

To anticipate under §102, a single reference must teach *every aspect* of the claimed invention. References cannot be combined to prove an anticipation rejection. Assuming arguendo, even if combined, references ‘023 and Stamires do not disclose using a precursor (also referred as mixed metal oxide in the claims) in general and does not disclose using a precursor in an FCC unit. Stamires does not even disclose the precursor. As even repeated admitted by the Office Action, Stamires and ‘023 only disclose using an HTL, not using a precursor. “Precursor” to a hydrotalcite like compound, also referred as mixed metal oxide, is distinct from an HTL and defined within reasonable efforts in several places in this application as filed, such as but not limited to paragraph 10, 23, 55, 56, and 57:

[0010] “The invention also provides methods for reducing sulfur in gasoline by adding gasoline sulfur reduction additives comprising **mixed metal oxide compounds, also referred to as precursors of hydrotalcite like compounds, to an FCC unit**”

[0055] The mixed metal oxide compound can be a magnesium aluminate compound or can be in the form of a solid solution. In one embodiment, the mixed metal oxide is a precursor to a hydrotalcite like compound.

Furthermore, this application as filed includes and refers to **precursors** described in U.S. Patent No. 6,028,023:

[0032] Methods for making these mixed metal oxide compounds are described in U.S. Patent Nos. 6,028,023 and 6,479,421, the disclosures of which are incorporated by reference herein in their entireties.

In turn, precursors described in U.S. Patent No. 6,028,023 (as expressly referred in this application as filed) include but is not limited to:

“Applicant's overall invention is primarily based upon a two step “activation” procedure that is generally comprised of heat treating and then hydrating certain hereinafter described **hydrotalcite-producing, precursor compounds**”

“Applicant's invention has two general embodiments. The first embodiment is a method for producing HTL compounds (e.g., anionic clay compounds, hydrotalcite per se, and various hydrotalcite-like compounds) from compounds that do not possess the structural characteristics of HTL compounds. The manner by which this first embodiment of applicant's invention differs from prior art methods for making similar HTL compounds is that applicant's initial HTL synthesis is carried out using those ingredients and those reaction conditions which are such that they do not directly produce compounds having a HTL structure, but rather produce compounds that exhibit a HTL structure only after experiencing applicant's hereinafter described activation process. Hence, in the first embodiment of this invention, an actual XRD determination that the product of applicant's initial slurry or precipitation synthesis reaction does not produce a compound having an XRD pattern that reasonably resembles that of a compound having the proper ingredient atoms (e.g., those of magnesium, aluminum, oxygen and hydrogen in the case of HTL compounds) on file with the ICDD could be an optional step in applicant's overall process.”

“It also should be specially noted, however, that applicant's synthesis products may well include “amorphous” (non-crystalline) materials as well as non-HTL, crystalline phases--and combinations thereof. Indeed, the term “amorphous” as used herein could include (1) crystalline phases which have crystallite sizes below the detection limits of conventional x-ray diffraction techniques, (2) crystalline phases which have some significant degree of ordering, but which lack a crystalline diffraction pattern due to dehydration or dehydroxilization (such as in layered aluminosilicates), and (3) true amorphous materials which may exhibit short range order, but no long range order, such as, for example, silica and borate glasses.”

“Whatever their physical form (crystalline or amorphous), these precursor, synthesis reaction products may be subjected to some form of

"low temperature" (i.e., "low temperature" may be taken to mean less than about 250°C., for the purposes of this patent disclosure) drying process before they undergo the heat treatment aspect of applicant's activation process. Such a low temperature drying process also may include the physical formation of those powders, pellets, beads, extrudates, microspheroidal spheres or granule forms of these reaction product materials that may be required (or desired) for use of these materials as catalysts, sorbents, ion exchange agents, etc. This drying step should, however, be considered "optional" because the most fundamental version of the first embodiment of applicant's invention could go directly to its heat treatment step."

"This heat treatment step involves heating applicant's synthesis reaction products to a "medium temperature" (i.e., a temperature in the range of about 300°C. to about 850°C.). This heat treatment may be carried out for widely varying periods of time (e.g., from for about 0.1 to about 24.0 hours. This 300°C.-850°C. heat treatment step may generally be referred to as Step 1 of applicant's overall "activation" process. It is more preferred, however, that Step 1 be conducted at a temperature on the low-end of this 300°C.-850°C. range. This treatment may be carried out at some preferred temperature (e.g., 450°C.) or at different temperatures in this 300°C. to 850°C. range. Step 1, medium temperature, heat treatments in the range of about 400°C. to about 500°C. are, however, highly preferred. Temperatures at the upper end of applicant's 300°-850°C. range, such as temperatures ranging from about 700°-850°C., are less preferred since various less desirable phases (hereinafter more fully described) may result from heating **applicant's precursor, synthesis reaction products to such levels.** The formation of these less desirable phases may diminish the precursor material's potential to form maximum amounts of the HTL-containing phases that are the object of applicant's processes."

(Col. 7 line 57- Col. 9 line 4)

Precursor has multiple unexpected benefits and characteristics which differ from an HTL or calcined HTL, thereby showing that the precursor is not the same composition as HTL or calcined HTL.

Attrition Index and ABD

The precursor has multiple different characteristics from an HTL or calcined HTL, each characteristic which independently refute that the present claims are indefinite. For example, TABLE IV and FIG. 5 in the '023 reference (Col. 22 line 47-55) shows that the precursor has an attrition resistance and ABD that differs from an HTL:

TABLE IV

HTL Composition	Attrition Index (ASTM)	*ABD (g/cc)
2 Mg/IAI (Step 1 Activation)	3.9	0.39
2 Mg/IAI (Step 2 Activation)	0.54	0.96
5 Mg/IAI (Step 1 Activation)	15	0.36
5 Mg/IAI (Step 2 Activation)	0.65	0.75

\*Apparent Bulk Density

As shown in patent '023 Table IV, "2 Mg/IAI (Step 1 Activation)" line 1 with Attrition Index 3.9 and 0.39 is an embodiment of the precursor, also referred as mixed metal oxide, in pending claims. The composition "2 Mg/IAI" (Step 2 Activation)" 2<sup>nd</sup> line with Attrition Index 0.54 and 0.96 ABD is an embodiment of HTL. The composition with "5 Mg/IAI (Step 1 Activation)" 3<sup>rd</sup> line with Attrition Index 15 and 0.36 ABD is another embodiment of the precursor. The composition with "5 Mg/IAI (Step 2 Activation)" 4<sup>th</sup> line with Attrition Index 0.65 and 0.75 ABD is another embodiment of an HTL. Thus, '023 reference, with multiple examples, shows that the precursor has a different Attrition Index and ABD than HTL, and hence are not the same compositions, each characteristic which independently refute that the present claims are anticipated or obvious.

TABLE V in the '023 reference shows:

Table V

HTL Composition	Attrition Index (ASTM)	*ABD (g/cc)
2 Mg/1Al (Step 1 Activation)	3.9	0.96
2 Mg/1Al (Step 2 Activation)	0.54	0.96
2 Mg/1Al (Additional heat to 732°C./hr.)	0.81	0.80

TABLE V in the '023 reference (Col. 22 line 47-55) shows that the precursor has an attrition resistance and ABD that differs from a calcined HTL. The composition with "2 Mg/1Al" 3<sup>rd</sup> line with Attrition Index 0.81 and 0.80 ABD is an embodiment of a calcined HTL. Thus, '023 reference shows that the precursor has a different Attrition Index and ABD than calcined HTL, and hence are not the same compositions, each characteristic which independently refute that the present claims are anticipated or obvious.

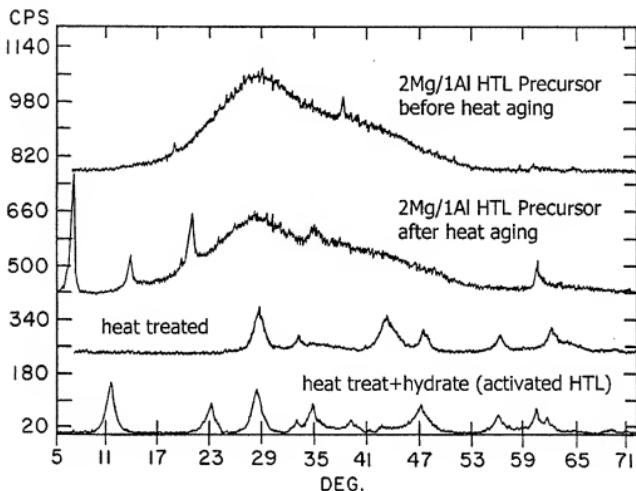
Thus, '023 reference Tables IV and V shows that the precursor has a different Attrition Index and ABD than HTL and calcined HTL, and hence are not the same compositions.

X-ray diffraction pattern

'023 patent states:

"FIG. 5 shows the changes in crystal structure at various steps in applicant's "activation" process. The top two curves in this plot (respectively labeled "2Mg/1Al Precursor before heat aging" and "2Mg/1Al Precursor after heat aging") already have been discussed as part of the previous discussion of FIGS. 1 to 4. The trace in FIG. 5 labeled "heat treated" is representative of the observed phases of HTL structures following Step 1 of applicant's activation process. The trace labeled "heat treat+hydrate (activated HTL)" depicts the results of Step 2 of applicant's activation process. Clearly, an HTL structure has been created. This is evidenced by the presence of all major peaks of an HTL compound, including peaks at about 11.271 degrees, 22.700 degrees and 34.358 degrees manifesting their presence. It also should be noted that FIG. 5 includes the effects of the CeO<sub>2</sub> component that was added during the synthesis reaction and whose most prominent peaks manifest themselves at 28.555 degrees, 47.479 degrees and 56.335 degrees." (Col. 19 line 26-45)

Thus, '023 reference Fig. 5 shows that the precursor has a different x-ray diffraction (XRD) pattern than HTL, and hence HTL and precursor are not the same compositions. Fig. 5 of '023 reference shows that the 3<sup>rd</sup> graph from top labeled 'heat treated' is the x-ray diffraction pattern of the precursor while the 4<sup>th</sup> graph labeled "heat treat+hydrate (activated HTL)" is the resulting HTL structure, wherein the 3<sup>rd</sup> and 4<sup>th</sup> graphs are not the same.



The application as filed also shows that the precursor has other different characteristics from an HTL or calcined HTL, such as degree of gasoline sulfur reduction, product yield, and yield shift, and hence are not the same composition. For example, gasoline sulfur reduction of using Example 1 additive B which is an embodiment of the methods of using mixed metal oxide or precursors of this invention, reduced gasoline sulfur (9.6) more than the collapsed HTL of additive A and C in example 1. Example 1 additive D is also an embodiment of using mixed metal oxide or precursor of this invention which reduced gasoline sulfur. Thus, embodiments of methods of using precursors of the present invention are useful to reduce gasoline sulfur. Additionally, Table 2 and Table 3 paragraph 74 of this application as filed provides further

support that the precursor has other different characteristics from an HTL or calcined HTL, such as product yield, and yield shift. Thus, the application as filed shows that precursor has multiple different characteristics from an HTL or calcined HTL, such as, but not limited to, Attrition Index and ABD, X-ray diffraction pattern, degree of gasoline sulfur reduction, product yield, and yield shift.

Precursor has Multiple Different Structural differences from an HTL:

In addition to unexpected benefits and differing characteristic, such as Attrition Index, ABD, greater SO<sub>x</sub> sorption and pick up as mentioned, the precursor has a different structure than HTL.

The precursor has a structure of MgAl oxide wherein the Al is in the MgO structure. In contrast, HTL structure includes Al or trivalent cation in Mg(OH)<sub>2</sub>, as known to one of ordinary skill in the art and described in '023 patent. Thus, the precursor has a different structure than HTL, and hence is not the same composition.

Thus, '023 alone or in view of Stamires do not disclose *using a precursor* in general and not in an FCC unit:

1) "Precursor" to a hydrotalcite like compound, also referred as mixed metal oxide compound, is not and cannot be the same composition as a "hydrotalcite like compound" or calcined HTL based on multiple differing characteristics from an HTL or calcined HTL, such as Attrition Index and ABD, X-ray diffraction pattern, degree of gasoline sulfur reduction, product yield, and yield shift. Each characteristic independently shows that the precursor is not and cannot be the same composition as an HTL or calcined HTL.

2) '023 alone or in view of Stamires does not disclose *using a precursor* in an FCC unit. Nor does '023 alone or in view of Stamires disclose using a precursor in an FCC unit to reduce gasoline sulfur, etc. and Stamires does not even disclose the precursor.

3) Thus, reducing gasoline sulfur emissions from a FCC unit or cracking unit with a precursor or mixed metal oxide compound is not and cannot be inherent or obvious because HTL and calcined HTL are different from a precursor (as discussed) and '023 does not disclose using a

precursor for such uses and hence the precursor is not and cannot be in the FCC unit or cracking unit to necessarily, inherently or obviously reduce gasoline sulfur. In other words, reducing gasoline sulfur emissions from an FCC unit or cracking unit with a precursor is not and cannot be inherent when the precursor is not in the FCC unit or cracking unit and when the references do not suggest using the precursor or as in Stamires, does not even disclose the precursor. Thus, a new method for reducing gasoline sulfur with a precursor is not inherent or obvious over '023 alone or in view of Stamires and is patentable because new method or use of a compound is patentable.

Furthermore, to establish a *prima facie* case of obviousness, according to MPEP and past and recent case law, it is and still remains *necessary* for the Examiner to demonstrate a motivation to modify, some reason that would lead **one of ordinary skill in the art modify a known prior art.** Takeda Chemical Industries, Ltd. v. Alphapharm Pty., Ltd. 06-1329 Fed. Cir. 2007. Allegations of 'obvious to try is not sufficient if "the situation presented was not one with "a finite number of *identified, predictable solutions.*"' Thus, an Examiner must necessarily identify some reason that would have led one of ordinary skill in the art to make the modification. In this case, as stated above, Stamires does not even disclose the precursor and '023 does not disclose using the precursor. Hence, Stamires cannot fill the missing element. Thus, reducing gasoline sulfur emissions from a FCC unit or cracking unit with a precursor or mixed metal oxide compound is not and cannot be inherent or obvious.

Consequently, Applicant respectfully submits that independent claims 57, 77, 100, and 104 are not anticipated, inherent or obvious. As current independent claims are allowable, all the dependent claims which depend from the respective independent claims are also allowable.

A terminal disclaimer is included regarding alleged provisional double patenting in view of copending Appl. No.10/729,270. Current pending application is a continuation in part of the copending Appl. No.10/729,270.

Applicant respectfully requests an Examiner interview and or submits that the present amendment places the application in condition for allowance. The Director is hereby authorized

Application No. 10/749,695  
Amendment dated September 10, 2007  
Reply to Office Action of April 10, 2007

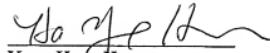
Docket No.: 0113222.00146US1

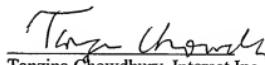
to charge any payments that may be due in connection with this reply to Wilmer Cutler  
Pickering Hale and Dorr LLP Deposit Account No. 08-0219.

Respectfully submitted,

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